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INTRODUCTION

The aim of this project is to analyze data provided by the Global Terrorism Database (GTD), a database that compiles information on over 180,000 terrorist attacks occurring between 1970 and 2017. This database includes details such as the exact location, the year and the number of deaths per attack.

Our goal is to raise awareness about the ongoing issue of terrorism and its impact on different regions of the world, encouraging a broader understanding of the challenges it poses.

We have divided the project into three distinct parts for better clarity: the worldwide heatmap, the timeline of the number of deaths of the terrorist attacks per year, and the detailed table that summarizes key data points, and to search for specific information.

THE DATABASE

The database of the project ("Global Terrorism Database") was extracted from Kaggle (https://www.kaggle.com/datasets/START-UMD/gtd).

The Global Terrorism Database (GTD), maintained by the START center at the University of Maryland includes information on over 200,000 terrorist incidents from 1970 to 2019, covering key details such as date, location, weapons used, number of casualties, perpetrators, and attack types.

WHO WOULD USE THIS

The main intended users could be government officials, security analysts, academic researchers, journalists interested in understanding global terrorism and historians who want to understand big terrorism incidents through history.

These people need easy-to-read visuals and analysis to see patterns, trends, and connections in the data.

This helps them make better decisions, create policies to prevent attacks, and clearly share important findings.

WORLDWIDE HEAT MAP

The first component of the visualization is a world map where countries are coloured according to the total number of deaths caused by terrorism. A gradient of colours ranging from light beige to dark red is used to represent the severity: countries with a higher number of terrorism-related deaths are shown in darker shades, while those with fewer or no deaths appear in lighter tones or grey.

This colourful map provides a clear and intuitive way to identify which countries have been most affected by terrorism. From the visualization, it is evident that countries such as Iraq, Afghanistan, Nigeria, Pakistan, and India are among the hardest hit, shown in the darkest red hues. On the other hand, regions like Canada, parts of Europe, and some areas in East Asia show relatively lighter colors, indicating fewer deaths.

This map is effective for visualizing geographical patterns and differences in the intensity of terrorism across the globe. It allows viewers to detect regional clusters of high impact, often aligned with zones of conflict or political instability.

TIMELINE OF GLOBAL TERRORISM DEATHS

The second element of the visualization is a line chart that displays the number of deaths caused by terrorism worldwide from 1970 to 2017. Each point on the line represents the total deaths each year, allowing the viewer to observe long-term trends and major fluctuations over time.

This timeline reveals several key patterns:

- 1970s-1990s: the number of terrorism deaths remained relatively low and stable, with some picks due to regional conflicts.
- Early 2000s: a noticeable peak appears around 2001, corresponding to the 9/11 attacks in the United States. However, the overall trend remains moderate immediately after.
- 2010-2015: a dramatic increase in deaths is observed, peaking around 2014–2015. This surge is associated with the rise of extremist groups such as ISIS, leading to widespread violence in the Middle East and parts of Africa.
- Post 2015: a slight decline is visible after the peak, though the death toll remains significantly higher than in earlier decades.

This timeline is effective in showing how terrorism has evolved as a global threat, emphasizing specific periods of escalation and hinting at the influence of geopolitical events. It highlights the growing intensity and reaches of terrorism in the 21st century.

HEATMAP OF TERRORISM DEATHS PER COUNTRY AND YEAR

The third component of the visualization is a heatmap that shows terrorism-related deaths across both countries (rows) and years (columns). Each cell represents the number of deaths in a specific country during a specific year, using colour intensity to indicate magnitude: darker or more saturated cells reflect higher death counts, while lighter cells suggest fewer or no deaths.

This heatmap offers a detailed and granular view of the temporal and geographic distribution of terrorism:

- Countries such as Iraq, Afghanistan, Nigeria, and Syria show consistently darker cells across multiple years, reflecting prolonged periods of high terrorism-related fatalities.
- Some countries exhibit short but intense periods of activity, with darker cells limited to just a few years.

● Others show scattered or minimal activity, suggesting either rare or isolated incidents of terrorism.

This type of visualization is particularly valuable for:

- Trend detection: it helps identify specific years when terrorism intensified in particular countries.
- Historical Context: researchers can match peaks in the heatmap with known political or military events (e.g., invasions, civil wars, or the emergence of terrorist groups).

In short, the heatmap adds a temporal layer to the global map, enabling both a broad overview and a detailed, country-specific analysis of terrorism trends.

RELATIONSHIP BETWEEN WORLDWIDE HEATMAP AND HEATMAP PER YEAR & COUNTRY

An important interactive feature of this visualization is the connection between the global choropleth map and the detailed heatmap by country and year. When a user hovers over or clicks on a specific cell in the heatmap (which corresponds to a particular country and year) the global map automatically highlights the selected country. This dynamic link enhances the user experience by immediately showing the geographical location of the country in question, reinforcing spatial awareness.

This interaction is especially useful for viewers unfamiliar with all country names or locations. It allows for seamless exploration of patterns in terrorism deaths: a user can detect a dark cell (e.g., a peak in deaths in a lesser-known country in a given year) and instantly locate it on the world map. This synchronized highlighting bridges the temporal and geographic dimensions of the data, encouraging deeper exploration and more intuitive understanding of global terrorism trends.

PCA

The final visualization presents a Principal Component Analysis (PCA) projection of the terrorism dataset. PCA is a dimensionality reduction technique that helps simplify complex datasets by projecting them onto principal components (new variables that capture the most variance in the original data)

In this case, each point on the scatter plot represents a terrorist incident or aggregated data point, projected into a two-dimensional space using the first two principal components (PC1 and PC2). This visualization allows us to identify hidden patterns and potential clusters in the data that may not be immediately visible in the geographic or temporal charts.

While the PCA projection does not retain geographic information directly, it can group together events or countries with similar terrorism characteristics (such as number of deaths, attack types, or target types). For example, clusters could indicate regions or time periods with comparable patterns of terrorism behaviour.

This plot is especially useful for analysts and researchers trying to explore the structure of the data, detect anomalies, or perform further statistical modelling.

CONCLUSION

This project provides a comprehensive visual exploration of global terrorism trends from 1970 to 2017 using data from the Global Terrorism Database. Through the combination of a choropleth map, a timeline of deaths, a heatmap by country and year, and a PCA projection, we offer multiple lenses to examine the scale, distribution, and evolution of terrorist activity over time.

Several key insights emerge from this analysis:

- Certain countries like Iraq, Afghanistan, and Nigeria have faced persistently high levels of terrorism-related deaths.
- The early 2010s saw a dramatic global surge in terrorism, largely driven by organized extremist groups.

- There are both long-term conflict zones and countries that experienced short but intense spikes in attacks.
- Visual tools like PCA allow us to further examine structural similarities and variations across incidents.

Ultimately, this project highlights the importance of using data to better understand the dynamics of global terrorism. By identifying patterns and temporal shifts, we can help inform policy, humanitarian response, and academic research, fostering more informed and proactive approaches to addressing such a complex and persistent global issue.